



Thousands of nuts, bolts, gloves and other debris from space missions form an orbiting garbage dump around Earth, presenting a hazard to communication satellites. Take a look at how the Air Force keeps track of the

# SPACE JUNK



## 3 ground-based surveillance systems use telescopes to take snapshots, map data to computer monitors

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INDIAN OCEAN — Roughly 15,000 miles above the Earth's surface is a communications satellite that provides vital information to all branches of the U.S. military.

But, it's not alone up there. In fact, it has to dodge thousands of pieces of man-made debris that can come into its path.

To keep that from happening, Air Force teams are manning Ground-Based Electro-Optical Deep Space Surveillance Systems, known as GEODSS, that track more than 9,000 pieces of junk in space. These objects range from active payloads, such as satellites, to "space junk," such as debris from launch vehicles and satellite breakups.

"We act as a passive police force, watching for natural or artificial interference," said Bruce Bookout, GEODSS site manager here. "Those (who) use space to fight the (War on Terror) need to ensure those assets are available and are under no threat."

### HOW IT WORKS

GEODSS performs its mission using a 1-meter telescope equipped with highly sensitive digital camera technology, known as Deep STARE. Each detachment has three of these telescopes that can be used in conjunction with each other or separately. These telescopes are able to

"see" objects 10,000 times dimmer than the human eye can detect.

The Deep STARE system is able to track multiple satellites in the field of view. As satellites cross the sky, the telescopes take rapid electronic snapshots, showing up on the operator's console as tiny streaks.

Computers then measure these streaks and use the data to figure the current position of a satellite in its orbit.

Star images, which remain fixed, are used as references or calibration points for each of the three telescopes.

### KEEPING THE TROOPS SAFE

"Space surveillance provides critical information on the location of every man-made object in space. (It ensures) our space-based assets are protected from potential on-orbit collisions or from adversaries who might try to take away our abilities to operate in space. This guarantees the warfighter access to space-derived tools they need to execute their mission," said Mr. Bookout.

The Det. 2 commander, Maj Jay Fulmer, said, "Many of our (servicemembers) serving on the front lines use technology that is greatly enhanced through the use of space. (Our detachments, which are) part of a global space surveillance network, ensure the U.S. and our allies have the ability to operate unencumbered in the medium of space, allowing our troops direct access to space-derived force enhancements."

Maj. Jay Fulmer (left) uses space and missile analysis software to track known man-made deep space objects in orbit around Earth. He's the Det. 2 commander here, which is one of three GEODSS sites that report to the 21st Space Wing at Peterson AFB, Colo. The other two are Det. 1 in Socorro, N.M., and Det. 3 in Maui, Hawaii. Each GEODSS site transmits its orbital data to U.S. Strategic Command's Joint Space Operations Center located at Cheyenne Mountain AFS in Colorado Springs, Colo. The center maintains a satellite catalog of every man-made object in Earth's orbit.



» The most space debris created by a spacecraft's destruction was due to the upper stage of a Pegasus rocket launched in 1994. Its explosion in 1996 generated a cloud of some 300,000 fragments. To see a list of the space junk and who owns it, see [www.space.com/spacewatch/space\\_junk\\_list.html](http://www.space.com/spacewatch/space_junk_list.html)

» The oldest debris still in orbit is a non-working satellite launched in 1958.

» During the first American space walk in 1965, Gemini 4 astronaut Edward White lost a glove.

### JARGON WATCH

» **GEODSS:** Ground-Based Electro-Optical Deep Space Surveillance Systems

» **Deep STARE:** A combination of three telescopes that tracks multiple satellites, and that can see objects 10,000 times dimmer than the human eye.